IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL claims 2, 4, 8, 12, and 15 without prejudice or disclaimer and AMEND claims 1, 3, 5, 6, 7, 9, 11, 14, 18, and 19.

in accordance with the following:

1. (Currently Amended) A linear compressor, comprising:

a drive motor;

a piston reciprocating by the drive motor; and

a control unit to generate a reference current having a phase difference of 90° and an equal frequency with respect to a displacement waveform of the piston, and to control a drive current supplied to the drive motor to synchronize with a resonance frequency of the piston by synchronizing the drive current with the reference current,

wherein the control unit receives top and bottom dead center commands from an outside of the linear compressor, and sets a maximum amplitude of the reference current so that the drive current is synchronized with the reference current to allow top and bottom dead centers of the piston to satisfy the top and bottom dead center commands, respectively, and

wherein the control unit compensates for differences between the commanded top dead center and an actual top dead center of the piston and between the commanded bottom dead center and an actual bottom dead center of the piston.

2. (Cancelled)

3. (Currently Amended) A linear compressor, comprising:

a drive motor;

a piston reciprocating by the drive motor; and

a control unit to generate a reference current having both a phase thereof and a frequency thereof equal to a phase and a frequency of a speed waveform of the piston, and to control a drive current supplied to the drive motor to synchronize with a resonance frequency of the piston by synchronizing the drive current with the reference current,

wherein the control unit receives top and bottom dead center commands from an outside of the linear compressor, and sets a maximum amplitude of the reference current so that the drive current is synchronized with the reference current to allow top and bottom dead centers of the piston to satisfy the top and bottom dead center commands, respectively, and

wherein the control unit compensates for differences between the commanded top dead center and an actual top dead center of the piston and between the commanded bottom dead center and an actual bottom dead center of the piston.

4. (Cancelled)

5. (Currently Amended) A linear compressor, comprising:

a drive motor;

a piston reciprocating by the drive motor;

a displacement sensor to detect a displacement of the piston;

a displacement/speed detecting unit to generate at least one of a displacement waveform and a speed waveform of the piston based on a value detected by the displacement sensor; and

a control unit to generate a reference current satisfying a condition in which the reference current has a phase difference of 90° and an frequency equal to the displacement waveform of the piston, or a condition in which the reference current has a phase and a frequency thereof equal to a phase and a frequency of the speed waveform of the piston, and to control a drive current supplied to the drive motor to synchronize with a resonance frequency of the piston by synchronizing the drive current with the reference current,

wherein the control unit receives top and bottom dead center commands from an outside of the linear compressor, and sets a maximum amplitude of the reference current so that the drive current is synchronized with the reference current to allow top and bottom dead centers of the piston to satisfy the top and bottom dead center commands, respectively, and

wherein the control unit compensates for differences between the commanded top dead center and an actual top dead center of the piston and between the commanded bottom dead center and an actual bottom dead center of the piston.

6. (Currently Amended) A linear compressor, comprising:

a drive motor;

a piston reciprocating by the drive motor;

a displacement/speed detecting unit to detect a displacement of the piston using electrical characteristic values of the drive motor, and to generate at least one of a displacement waveform and a speed waveform of the piston based on the detected displacement; and

a control unit to generate a reference current having a phase thereof and a frequency thereof equal to a phase and a frequency of a speed waveform of the piston, and to control a drive current supplied to the drive motor to synchronize with a resonance frequency of the piston by synchronizing the drive current with the reference current, wherein the electrical characteristic values of the drive motor include resistance information, inductance information, and back electromotive force constant information of the drive motor.

7. (Currently Amended) The linear compressor according to claim 6, wherein the ~~electrical characteristic values of the drive motor include~~ displacement/speed detecting unit to detect a displacement of the piston uses a drive voltage and a drive current which are supplied to the drive motor in addition to the electrical characteristic values of the drive motor.

8. (Cancelled)

9. (Currently Amended) An apparatus to control a linear compressor having a drive motor and a piston reciprocating by the drive motor, the apparatus comprising:

a displacement/speed detecting unit to generate at least one of a displacement waveform and a speed waveform of the piston;

an amplitude control unit to set a maximum amplitude of a drive current required to control the drive motor so that top and bottom dead centers of the piston, respectively, satisfy top and bottom dead center commands received from an outside of the linear compressor;

a phase control unit to generate a reference waveform satisfying a condition in which the reference waveform has a phase difference of 90° with respect to the displacement waveform of the piston and a frequency equal to the displacement waveform of the piston, or a condition in which the reference waveform has both a phase thereof and a frequency thereof equal to a phase and a frequency of the speed waveform of the piston; and

a current control unit to generate a reference current according to amplitude information and phase and frequency information provided from the amplitude control unit and the phase control unit, respectively, and to control the drive current supplied to the drive motor to synchronize with the reference current, and

4

wherein the control unit compensates for differences between the commanded top dead center and an actual top dead center of the piston and between the commanded bottom dead center and an actual bottom dead center of the piston.

10. (Original)   The linear compressor control apparatus according to claim 9, further comprising a displacement sensor to detect a displacement of the piston, the displacement/speed detecting unit generating at least one of the displacement waveform and the speed waveform of the piston based on the displacement of the piston detected through the displacement sensor.

11. (Currently Amended)   An apparatus to control a linear compressor having a drive motor and a piston reciprocating by the drive motor, the apparatus comprising:

a converter to convert alternating current power into direct current power;

an inverter to generate alternating current power with a variable voltage and a variable frequency required to drive the drive motor;

a current detecting unit to detect a drive current supplied to the drive motor;

a voltage detecting unit to detect a supply voltage supplied to the drive motor;

a displacement sensor to detect a displacement of the piston;

a displacement/speed detecting unit to generate at least one of a displacement waveform and a speed waveform of the piston based on the displacement detected through the displacement sensor;

an amplitude control unit to set a maximum amplitude of a drive current required to control the drive motor so that top and bottom dead centers of the piston, respectively, satisfy top and bottom dead center commands received from an outside of the linear compressor;

a phase control unit to generate a reference waveform satisfying a condition in which the reference waveform has a phase difference of 90° and a frequency equal to the displacement waveform of the piston with respect to the displacement waveform of the piston, or a condition in which the reference waveform has both a phase thereof and a frequency thereof equal to a phase and a frequency of the speed waveform of the piston; and

a current command generating unit to generate a current command signal having frequency information and phase information of the reference waveform generated by the phase control unit, and maximum amplitude information generated by the amplitude control unit; and

a current control unit to control a switching operation of the inverter to allow the drive current to synchronize with the frequency, phase and maximum amplitude information of the

current command signal while monitoring the drive current detected through the current detecting unit and supplied to the drive motor,

wherein the amplitude control unit comprises:

a first adder to obtain a difference between a commanded top dead center based on the top dead center command received from the outside of the linear compressor and an actual top dead center of the piston;

a second adder to obtain a difference between a commanded bottom dead center based on the bottom dead center command received from the outside of the linear compressor and an actual bottom dead center of the piston; and

an amplitude setting unit to set the maximum amplitude of the drive current supplied to the drive motor to an intensity to compensate for the differences between the commanded top dead center and the actual top dead center and between the commanded bottom dead center and the actual bottom dead center, obtained by the first and second adders, respectively.

12. (Cancelled)

13. (Original)   The linear compressor control apparatus according to claim 11, wherein the phase control unit comprises:

a voltage controlled oscillating unit;

a phase comparing unit to compare phases of signals, respectively, output from the displacement/speed detecting unit and the voltage controlled oscillating unit with each other, and to generate a voltage signal with an intensity proportional to a phase difference therebetween, the voltage controlled oscillating unit outputting a sine wave signal with a frequency varying in proportion to an intensity of the voltage signal output from the phase comparing unit; and

a phase difference generating unit shifts a phase of the sine wave signal output from the voltage controlled oscillating unit by 90° such that the drive current has a phase difference of 90° compared to the displacement waveform of the piston, or has a phase equal to that of the speed waveform of the piston.

14. (Currently Amended) A linear compressor with a fluctuating load thereon, comprising:

a drive motor;

a piston reciprocating by the drive motor;

a displacement/speed detecting unit to detect a displacement of the piston using electrical characteristic values of the drive motor; and

a control unit to synchronize a frequency of a drive current supplied to a drive motor with a reference current having a resonance frequency thereof varying according to a load fluctuation,

wherein the synchronization is performed based on the electrical characteristic values, and

wherein the electrical characteristic values of the drive motor include resistance information, inductance information, and back electromotive force constant information of the drive motor.

15. (Cancelled)

16. (Original)   The linear compressor according to claim 2, further comprising:

a displacement sensor to detect a displacement of the piston; and

a displacement/speed detecting unit to generate one or both of a displacement waveform and a speed waveform of the piston according to the detected displacement of the piston and supplying the displacement and/or speed waveforms to the control unit.

17. (Original)   The linear compressor according to claim 2, further comprising:

a displacement/speed detecting unit to detect a displacement of the piston using electrical characteristic values of the drive motor, and to generate one or both of a displacement waveform and a speed waveform of the piston according to the detected displacement and supplying the displacement and/or speed waveforms to the control unit.

18. (Currently Amended) The linear compressor according to claim 17, wherein the ~~electrical characteristic values of the drive motor include~~ displacement/speed detecting unit to detect a displacement of the piston uses a drive voltage and a drive current which are supplied to the drive motor in addition to the electrical characteristic values of the drive motor.

19. (Currently Amended)   ~~The~~ A linear compressor ~~according to claim 17~~ comprising:

a drive motor;

a piston reciprocating by the drive motor;

a control unit to generate a reference current having a phase difference of 90° and an equal frequency with respect to a displacement waveform of the piston, and to control a drive current supplied to the drive motor to synchronize with a resonance frequency of the piston by

7.

synchronizing the drive current with the reference current, and

a displacement/speed detecting unit to detect a displacement of the piston using electrical characteristic values of the drive motor, and to generate one or both of a displacement waveform and a speed waveform of the piston according to the detected displacement and supplying the displacement and/or speed waveforms to the control unit,

wherein the control unit receives top and bottom dead center commands from an outside of the linear compressor, and sets a maximum amplitude of the reference current so that the drive current is synchronized with the reference current to allow top and bottom dead centers of the piston to satisfy the top and bottom dead center commands, respectively, and

wherein the electrical characteristic values of the drive motor include resistance information, inductance information, and back electromotive force constant information of the drive motor.

20. (Original) The linear compressor control apparatus according to claim 11, wherein the phase control unit comprises:

a voltage controlled oscillating unit; and

a phase comparing unit to compare phases of signals, respectively, output from the displacement/speed detecting unit and the voltage controlled oscillating unit with each other, and to generate a voltage signal with an intensity proportional to a phase difference therebetween, the voltage controlled oscillating unit outputting a sine wave signal with a frequency varying in proportion to an intensity of the voltage signal output from the phase comparing unit.